Space Weather Forecast

Issued on Friday, 07 October 2022 at 13:13 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Residual slight chance of minor geomagnetic storm G1 today. Reduced daily chance of Moderate-class X-ray flares throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low, with occasional low-level Common-class X-ray flares recorded. One of the largest of these flares was a long-period one tied to a possible 'filament lift-off' (arc of plasma ejected from the Sun) in the northwest that started around 07/0730UTC, perhaps nudged higher by concurrent brightening of both of the largest sunspot regions on the facing side. Imagery to determine the trajectory of any ejecta from the filament is not yet available, however is a source of active monitoring. At the current time, no Coronal Mass Ejections (CMEs) were seen in imagery.

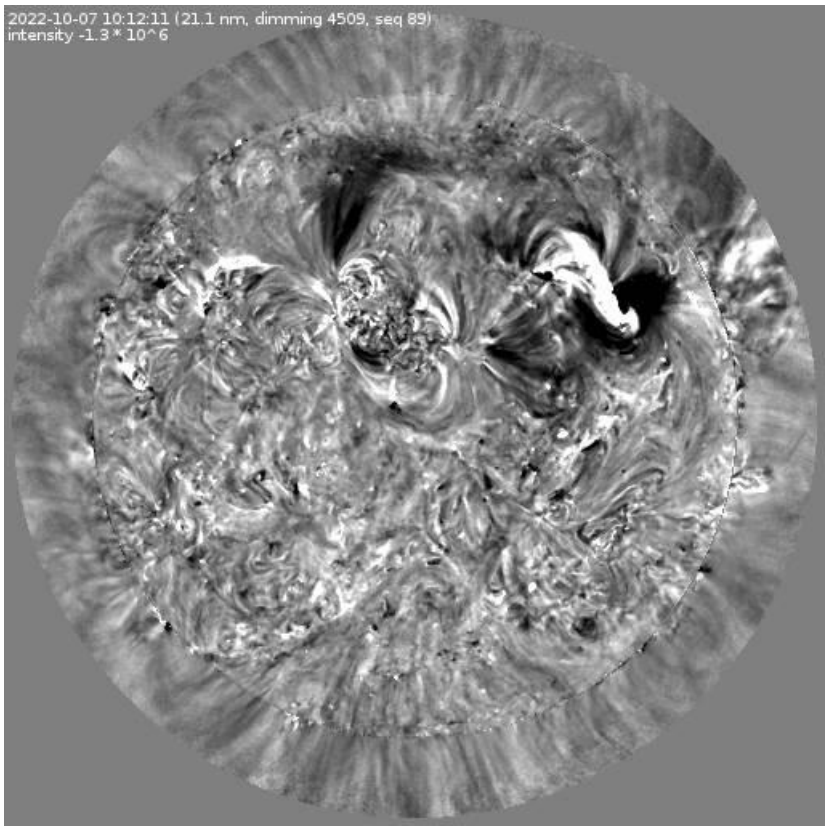

Figure 1: Time-integrated extreme UV satellite image sequence of the northwestern 'filament eruption', shown as the bright S-shape nested within the dark envelope upper right. The resulting CME will be analysed when it presents for analysis. Image processing courtesy of SIDC ROB.

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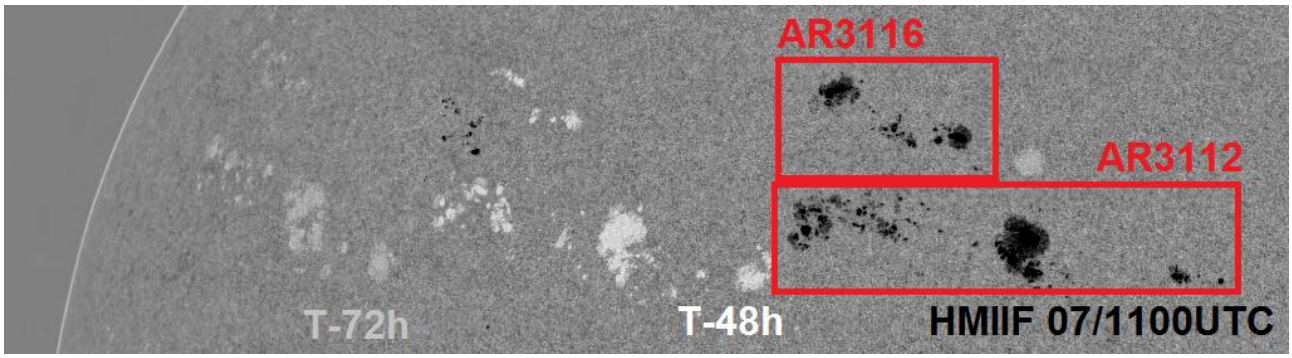
There are now seven sunspot regions on the Sun, with the development and numbering of a new, small magnetically bipolar region in the northeast. As in recent days, the facing side is dominated by the presence of the very large span of the most complex group which sprawls across about an eighth of the visible side of the Sun (in terms of longitude), although this spot group showed a slight decaying tendency in terms of area. The main potential 'threat' appears to be its contorted central portion, although this has yet to produce sympathetic activity. As well as this region, its immediate northern neighbour was the other noteworthy occupant of the front-side, showing slight proliferation of its intermediate spots. The remaining spots were small, and either stable or in decay, with little accompanying activity noted.

Figure 2: Helioviewer.org-derived false colour visible satellite running difference imagery for the present time (shown as the black footprints of spots), as well as T-48h and T-72h, showing trends in the two largest ('Active Region 3116' and 'AR3112').



Solar Wind / Geomagnetic Activity: Solar winds are a reasonable analogue for those seen at a satellite 1.5 days upwind of Earth, and Earth is now considered likely to be sampling the tail end of a fast wind. There may also be minor Coronal Mass Ejection (CME) activity mixed in to bolster the usually quiet tail of the incumbent 'coronal hole', although this is not conclusive.

The solar wind speed itself showed a gradual decline through Slightly Elevated levels, before recovering to early highs after 07/1000UTC. Both the number of particles and their associated magnetic field were unremarkable.

The net result of these solar wind measures was just below Minor Storm G1. A possible reason for the sustained activity seen may be some minor component of a CME, else the frequent changes in the orientation of the magnetic field vector, although these are not conclusive surmises.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity carries a now reduced chance of reaching moderate, with the main risk predominately attributed to the largest sunspot. No significant regions leave the Sun in the period, and one forecast arrival later in the UTC weekend has yet to present for analysis, leading to a flat risk trend throughout.

Solar Wind / Geomagnetic Activity: The possible 'filament eruption' mentioned in the Solar Activity section does not feature in this forecast, pending imagery for analysis.

The only transient that does potentially feature in the forecast is the CME from a filament eruption on Tuesday 04 October, which may still arrive at Earth imminently. Any forecast effects have been

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accordingly reduced for it being a later, slower and presumably less impactful arrival. This may still lead to a resurgence in Elevated winds, but the chances are now slight.

The residual fast wind should abate in earnest over the remainder of day one (Friday 07 October). The next fast wind enhancement is then due either later day 2 (Saturday 08 October) or day 3 from another arriving 'coronal hole', the risk continuing into early day 4.

Geomagnetic activity is Likely to remain a little perturbed in the immediate term, with a now reduced slight chance of Minor Geomagnetic Storm G1, from here reducing for a time early day two (Saturday 08 October). There is then a resurgent slight chance of G1/Minor Storms again from the forecast fast wind arrival, this probably peaking on day 3 (Sunday 09 October).

Energetic Particles / Solar Radiation: There is now a reduced very slight chance of minor solar radiation storms, most likely due to any activity in the largest sunspot group.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	20	10	20	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X	No	5	5	5	5

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Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	10	10
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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